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USSR: Toward a Reconciliation Of Marxist and Western Measures of National Income

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USSR: Toward a Reconciliation of Marxist and Western Measures of National Income

Central Intelligence Agency
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Introduction

The Soviet Union and other Communist nations employ the Marxian concept of national income rather than the Western concept of gross national product (GNP) for measuring national economic activity. The Marxian measure has been thoroughly analyzed and rejected by Western economists.

The USSR began publishing national income data in the late 1950s, and this in turn stimulated research—both conceptual and empirical—on the relationship between Soviet national income (SNI) and GNP. Among the earliest products of this research was a largely theoretical article by Nove in 1955.¹ The United Nations published a set of GNP accounts for the USSR for 1955 and attempted to reconcile its estimates with the scattered Soviet references to national income available at that time.² Nove and Zauberman published a detailed Western estimate of Soviet national income in 1959 using the Marxist construct.³

The UN has been a leader for many years in the development of national economic accounting and has published a series of manuals on recommended standards for GNP accounts.⁴ The UN

has also furthered the development of the Soviet system of accounts and recently published a technical manual originally developed by the Council for Mutual Economic Assistance.⁵ An integral part of this work has been efforts to develop the theoretical and empirical links between the Marxist national income and Western GNP systems. During the period 1959-63 the UN sponsored a series of meetings and working papers comparing the two systems. Among the issuances the most notable were a methodological paper by Seton and an empirical reconciliation exercise by Ruggles and Ruggles using the US 1958 accounts.⁶ Recently, the UN has begun a reexamination of this area and has published a comparative accounts methodological manual to accompany the latest revision of its GNP manual.⁷ The UN is planning to publish an accompanying volume with empirical results for several nations.

There has also been a history of estimates of Soviet GNP produced by Western economists. Because these estimates are prepared from data whose coverage and accuracy are often uncertain, Western investigators attempt to develop checks. One such procedure is to derive the

¹ Alec Nove, "Some Notes on Soviet National Income Statistics," *Soviet Studies*, vol. 6, no. 3, pp. 247-280, January 1955.

² United Nations, "An Estimate of the National Accounts of the Soviet Union for 1955," *Economic Bulletin for Europe*, vol. 9, no. 1, pp. 89-107, May 1957.

³ Alec Nove and Alfred Zauberman, "A Soviet Disclosure of Ruble National Income," *Soviet Studies*, vol. 11, no. 2, pp. 195-202, October 1959.

⁴ For example, UN, *A System of National Accounts*, New York, 1968.

⁵ UN, *Basic Principles of the System of Balances of the National Economy*, New York, 1971.

⁶ F. Seton, *Comparison of Production Concepts*, published by the UN as Conf. Eur. Stats/WG.15/2 November 1961. Richard and Nancy Ruggles, *A Comparison of National Accounts Data for the United States Classified According to the Concepts of the United Nations System of National Accounts and the Material Product System*, memorandum prepared for the US Bureau of the Budget for submission to the UN, February 1952.

⁷ UN, *Comparison of the System of National Accounts and the System of Balances of the National Economy, Part One, Conceptual Relationships*, New York, 1977.

estimate of Soviet national income implicit in the synthetically derived GNP accounts, then compare it with the officially published value.⁸ Becker, a leading authority in this field, extended his work with a paper on Soviet national income practices that included methodological estimates of the relation between Soviet and Western systems.⁹

In this paper we will summarize the methodological principles involved in comparing the Marxist and Western concepts and apply them to CIA's estimate of Soviet GNP in 1970.¹⁰ Earlier work is extended in two areas: appendix A discusses the foreign trade accounting problem in some detail, and appendix B demonstrates the possible use of input-output tables for connecting the two systems.¹¹ All of the data limitations of previous Western GNP estimates still apply to this empirical reconciliation, and many unresolved problems still remain.

Another area of great uncertainty in Soviet economic accounting is the treatment of defense expenditures. With the recent publication, by the CIA, of independent estimates of Soviet defense expenditures it is useful to set out the relation of these estimates to the GNP accounts.¹² The final section of this report is an initial attempt in this direction. Again it does not represent a definitive effort, but indicates that there is a general consistency between the two estimates and points out several areas that need further research.

⁸ For example, see Abram Bergson, *The Real National Income of Soviet Russia Since 1928*, Harvard University Press, Cambridge, 1961, pp. 179-181, and Abraham S. Becker, *Soviet National Income, 1958-64*, University of California Press, Berkeley, 1969, pp. 34-37.

⁹ Abraham S. Becker, "National Income Accounting in the USSR," in *Soviet Economic Statistics*, Duke University Press, Durham, 1972.

¹⁰ CIA, *USSR: Gross National Product Accounts, 1970*, A ER 75-00076, November 1975 (Unclassified). (Hereafter cited as CIA, *GNP Accounts*.)

¹¹ Both subjects have been discussed before, but the increasing flow of Soviet input-output and other economic data make these promising research areas.

¹² CIA, *Estimated Soviet Defense Spending in Rubles, 1970-75*, SR 76-10121U, May 1976 (Unclassified).

Definitions

Before discussing the differences between gross national product and Soviet national income, a few basic definitions should be set out.

Gross national product (GNP) is the total value of the final sales of goods and services at market prices produced by the labor and property of a given nation in a given time period. It is gross product rather than net because no deduction is made for depreciation and other capital consumption allowances. GNP less capital consumption allowances equals net national product (NNP). Other goods and services charged to current expense are deducted, however, so that GNP includes only final sales.

The principal components of GNP are: personal consumption expenditures (PCE), government purchases of goods and services (G), gross investment in fixed capital and inventories (I), and net exports of goods and services.

Personal consumption expenditures include the goods and services purchased by individuals, the value of goods and services received in kind by individuals, and the operating expenses of non-profit institutions. The United States divides PCE into purchases of durable goods (automobiles, furniture, radios, televisions); nondurables (food, clothing, fuel); and services (rent, medical, financial, educational, transportation).

Government purchases of goods and services include wages and other goods and services purchased by government institutions. This concept values government services at their monetary cost and makes no allowance for depreciation or profits. The United States also includes government purchases for investment purposes.

Gross investment includes the value of gross additions to fixed capital and the change in the physical volume of inventories. The United States includes private purchases of dwellings and investment by nonprofit institutions, but excludes government investment.

Net exports is the exports of goods and services (a domestic activity) less imports of goods and services (included in PCE, G, or I, but not a domestic activity).

Reflecting Western economic theory, GNP is a product- or demand-oriented concept. It can also be viewed as an income or supply concept. In Western accounting this consists of two parts: **national income**, or payments to the factors of production (wages, profits, rent, and interest) and **nonfactor payments** (depreciation, indirect business taxes, and subsidies).

Soviet national income (SNI) is also a supply-oriented concept. It represents the net value added in the production of material goods and in providing the limited number of services that are directly required to bring the material goods to their final sales point. These services are freight transportation, communications serving the sphere of material production, agricultural procurement, and the wholesale and retail trade networks. It is net rather than gross value added because capital consumption allowances are excluded. The main branches of material production are industry (including mining and manufacturing), agriculture, construction, and a small category called "other" branches of material production. These branches plus the services listed above make up the **productive sphere**. The remaining branches form the **nonproductive sphere**.

SNI is computed as a residual. First, the gross value of output of each branch is computed from its production data. Then the purchases by these productive branches of (1) materials, (2) the material services listed above, and (3) capital consumption allowances (essentially depreciation) are subtracted. The remainder is SNI. Included are wages and other employee compensation, profits, turnover and other indirect taxes, subsidies as a negative value, purchases of non-material services, interest on bank loans, social insurance contributions, and other small items.¹³ Subtracting depreciation makes SNI more analogous to NNP than GNP, but only in the productive sphere.

Depreciation is a special type of material input. SNI is intended to measure newly created value and must be net of the goods completely

consumed in the process of production. Capital assets, by definition, participate repeatedly in the productive process without physically being consumed. This gradual transfer of value is represented by calculated depreciation allowances. When a capital asset finally is retired, the accumulated depreciation allowances are compared with the original cost and a bookkeeping entry, plus or minus, is made to equate them. This additional allowance is also considered a material input for the year of retirement.¹⁴

SNI is then distributed directly or redistributed by the Soviet financial system until the various end users purchase the material products for final use. The domestic final use of material products is published as **Soviet national income utilized for consumption and accumulation (SNIU)**. It does not include exports, but does include imports of material products. Capital losses also are not included in SNIU, presumably because they were not "utilized." Losses include damage to fixed capital due to natural causes such as earthquakes; abandonment of unfinished construction; and spoilage of agricultural inventories. Therefore SNIU is less than SNI by the sum of net exports of material products plus capital losses.

SNIU includes personal consumption, material purchases of institutions serving the population, material purchases of science and administration, the growth of fixed capital, and the growth of working capital and reserves. The sum of the first three categories equals total consumption and the sum of the last two equals accumulation.

Personal consumption (PC) is roughly equal to consumption of durable and nondurable goods in the US GNP accounts, with some differences. For example, utilities are considered a service in PCE, but a material good in PC. The most significant difference is the inclusion of depreciation of housing in PC. This reflects the same reasoning that leads the Soviets to treat depreciation in the productive sphere as a material

¹³ For a more comprehensive list, see UN, *Basic Principles of Balances of the National Economy*, New York, 1971, pp. 21-23.

¹⁴ This bookkeeping entry is normally a substantial positive value because Soviet depreciation allowances are based on optimistic estimates of service lives.

purchase. Depreciation represents the value of the housing consumed in the current year and hence is part of PC. As in the productive sphere, the depreciation is calculated rather than actual monetary expenditures.

The nonproductive sphere is divided into two groups. The first is often labeled **consumer services** in the West, and consists of the following principal branches: housing, communal services, and public utilities; education, culture, and art; and health, social security, and physical culture. The second, sometimes labeled **state services**, consists of science and scientific services; finance, credit, and insurance; general administration; and other branches of the nonproductive sphere. The published data on SNIU include separate totals for the material expenditures of these two groups. As in PC, depreciation is included in both totals.

The growth of fixed capital is calculated as gross investment plus capital repair expenditures less depreciation allowances, the growth of unfinished construction, and losses. Depreciation is the sum of the depreciation in the productive sphere that was subtracted in computing SNI and the depreciation included in the consumption category of SNIU.

The growth of working capital and reserves represents the net growth of inventories, the growth of unfinished construction, and government strategic reserves. The latter are thought to include military as well as civilian goods.

The Difference Between GNP and SNI

With the accounting definitions in mind, we can examine the differences between GNP and SNI more closely.¹⁵ First, on the product or expenditure side, start with SNIU and work toward GNP. Adjust Soviet personal consumption to PCE by subtracting depreciation on housing and adding personal expenditures for services. Second, delete the material expenditures of

the services that sell their output. These include passenger transportation, personal communications, housing, utilities, and miscellaneous communal services. The remaining services are joined with the material expenditures of science and administration to form the current purchases of the government sector. To these material expenditures, wages and purchases of services must be added, and depreciation must be subtracted. The sales of services are now included in PCE and G.

Having adjusted PCE plus government outlays for goods and services, we now must adjust accumulation to equal gross investment. As explained earlier, this entails adding depreciation and losses. The result will be different from Soviet published investment data. The largest difference is that capital repair expenditures are included in the Western concept of gross investment, but not in Soviet published investment data. A smaller difference is that Soviet investment data include all current expenditures on machinery and equipment, construction, and other capital outlays, while the SNIU category, the growth of fixed capital, includes the value of completed investment projects, some of which began before the current year.

Finally, we must make adjustments for foreign trade. Soviet foreign trade is an accountant's nightmare because it is computed in two sets of prices. The regularly published data are in "foreign trade prices," which represent the transaction value in foreign currency converted to rubles at the official exchange rate. These prices often differ greatly from domestic prices, hence net exports will generally be very different depending on which prices are used. Appendix A discusses this problem at greater length. SNI accounting procedures appear to use foreign trade prices while Western estimates of Soviet GNP usually use domestic prices. In 1970, net exports in foreign trade prices were a positive 0.9 billion rubles while in domestic prices they are estimated at negative 6 billion rubles.

What is the net result of all the above adjustments? First, SNIU has been increased by the amount of productive depreciation. The adjustments for nonproductive depreciation and losses

¹⁵ The theory and rationale behind the various accounting techniques will not be developed in any detail. A wealth of material has already been published on the subject. For example, see UN, *A System of National Accounts*, New York, 1968, for discussions of Western concepts and B. P. Plyshevskiy's *Raspredeleniye Natsional'nogo Dokhoda v SSSR*, Moscow, 1960, for a discussion of Soviet concepts.

only rearrange the data. Second, there has been an increase in the value of services. To see what this increase is, divide the production of services into three components: those sold to enterprises and other intermediate consumers; those sold to individuals, the government, and other final consumers; and those provided by the government for free. SNIU includes the material expenditures for all three categories. GNP does not include any of the first category except as the value added in these services is reflected in the value of a good or service included in GNP by end use. They are part of intermediate consumption. Thus, GNP is less than SNIU by the amount of material expenditures involved in their production (including depreciation). For the second category, GNP includes personal and government expenditures on services at market prices. Therefore, GNP is greater than SNIU by the value added of services sold to individuals and governments and by the value of any other services that are purchased in order to produce these services. The third category of services is valued at cost in GNP. Thus GNP exceeds SNIU by the wages of government employees. Depreciation of government-owned capital stock is subtracted to be consistent with US accounting standards. In practice, services sold to enterprises are probably very small relative to those sold to individuals and governments plus those produced by the government at cost. Therefore, the generalization that GNP is greater than SNIU by the value added of the service sector is not greatly in error. In fact, subtracting the material expenditures of the first group is equal to adding its value added and subtracting its gross output. Therefore the net adjustment for the service sectors is equal to adding the total value added, subtracting services sold to the productive sphere and subtracting depreciation on government capital stock.

In sum GNP is greater than SNIU by (1) the value of productive depreciation, (2) the net adjustment for the value added of services as described above, and (3) the change in the valuation of net exports (normally negative).

The same result can be obtained by approaching the problem from the income side. SNI is the difference between gross output and material

purchases (including depreciation), and therefore includes any purchases of services by the productive sphere. To calculate GNP in the productive sphere, we add productive depreciation to SNI and subtract purchases of services by productive sectors. Next we must add the GNP originating in the nonproductive sector. As above, this is the value added of the services which are sold (including depreciation) plus the wages of government employees. We therefore arrive at the same net increase in the value added of services. Finally, SNI includes profits received by the government from foreign trade operations. When net exports are revalued in domestic prices, these earnings must be subtracted from SNI. Thus, we arrive at the same set of adjustments regardless of whether we work from the income or the product side of the accounts. The preceding discussion can be illustrated mathematically by using an input-output table. This exercise is shown in appendix B.

In practice, the comparison of the GNP and SNI of the Soviet Union is not easily carried out. In the CIA estimates of 1970 Soviet GNP, attempts were made to reconcile total GNP with total SNI, and PCE with Soviet personal consumption.¹⁶ When total GNP was adjusted to the SNI concept, it was 12.1 billion rubles higher than actual SNI. Consumption was considerably closer: the adjusted PCE value exceeded the published personal consumption value by 3.1 billion rubles. The following shows the specific steps involved in converting 1970 SNI to GNP using the method described above.

1. Remove housing depreciation from PCE—4.8 billion rubles.¹⁷
2. Add PCE for services (see table 1).¹⁸
3. Subtract the material expenditures by services that sell their output—6.1 billion rubles. This datum is not available in CIA's

¹⁶ CIA, *GNP Accounts*, pp. 17-18.

¹⁷ In the published CIA accounts, this value was given as 7 billion rubles (CIA, *GNP Accounts*, p. 18). This quantity has been revised to take account of more recent information. Since the same value is added in step 6, this change has no effect on the final result.

¹⁸ CIA, *GNP Accounts*, p. 4. An adjustment was made to the repair and personal care value so that it reflects only nonproductive activity.

Table 1

USSR: Personal Consumption Expenditures (PCE) for Services, 1970

	Billion Rubles
Total	19.8
Trade union and other dues	2.1
Housing	3.4
Personal transportation	7.2
Personal communications	1.2
Repair and personal care	2.1
Recreation and culture	2.6
Education	1.1
Health	0.1

accounts. It is estimated here on the basis of data from two Soviet monographs.¹⁹ The first monograph provides data on total material expenditures (including depreciation) for several nonproductive branches. The second provides data to estimate the share of depreciation in the total expenditures. Paid services were assumed to be transportation, communications, housing and communal economy, entertainment, and everyday services. Total material expenditures were estimated as 7.9 billion rubles and depreciation was estimated as 1.8 billion rubles.

4. Add the wages and purchases of services by the government sector—39.6 billion rubles. The wages and social security deductions (35.6 billion rubles) were taken from the CIA accounts.²⁰ To this was added an estimate of services purchased by the government of 4 billion rubles. The latter had to be estimated from data on the value added in these services and purchases by the private sector. This estimate is the weakest of this reconciliation.
5. Subtract depreciation in the government sector—6.1 billion rubles.²¹

¹⁹ V. M. Rutgayzer, *Resursy razvitiya neproizvodstvennoy sfery*, Moscow, 1975, p. 158, and I. M. Shneiderman, *Statistika uslug*, Moscow, 1974, p. 72.

²⁰ CIA, *GNP Accounts*, pp. 3 and 51-55. This item is the sum of wages and social security deductions in education, art, culture, health, physical culture, science, state administration, civilian police, administrative organs of social organizations, municipal services, and the military.

²¹ Rutgayzer, *op. cit.*, p. 157.

6. Add total depreciation to accumulation—40.8 billion rubles. This is the sum of items 1 and 5 above, plus productive depreciation and the residual book value of the retired productive capital as calculated in the CIA accounts.

7. Add losses to accumulation and delete this category from SNI—3.5 billion rubles. This was calculated as the total difference between SNI and SNIU (4.4 billion rubles), less net exports in foreign trade prices (0.9 billion rubles). This does not affect the value of GNP, only the estimate of investment.

8. Convert net exports from foreign trade prices to domestic prices—minus 7 billion rubles as calculated in the CIA accounts.

The results are summarized in table 2. The comparisons do not agree precisely with those published in the CIA accounts because of slight changes made in those accounts since their publication and because of the new estimates made in adjustments 1, 3, and 4 above.

Two possible sources of error could account for the discrepancies in the comparisons of investment and government expenditures. First, it is widely believed that significant expenditures for military hardware are included in the SNIU accumulation category. These should be transferred from investment to government. Since the amount of these expenditures is unknown, we will assume here that they are just enough to make the estimate of SNIU adjusted investment equal to that estimated here. Second, some of the change in unfinished construction may be double counted in the CIA accounts. The details are discussed below (see page 16). Here, we will only note that if this is true then CIA's estimate of investment might be reduced by as much as 4 billion rubles. Combining these two factors would reduce CIA investment to 116.1 billion rubles, require the transfer of 12.4 billion rubles from SNI investment to SNI government, and raise CIA's estimate of government expenditures by 4 billion rubles to 77.5 billion rubles. The SNI government total would become 63.2 billion rubles. Total GNP estimated by CIA would not

Table 2

USSR: Reconciliation of GNP and SNIU Accounts, 1970

Billion Rubles

	Total	Personal Consumption	Government	Investment (Accumulation)	Net Exports	Losses
Soviet national income utilized	289.9	177.9	23.4	84.2	0.9	3.5
Adjustments						
Housing depreciation	-4.8	-4.8				
PCE for services	19.8	19.8				
Material expenditures of sold services	-6.1		-6.1			
Wages and purchases of services by government	39.6		39.6			
Depreciation of government capital	-6.1		-6.1			
Total depreciation	40.8			40.8		
Losses	0			3.5		-3.5
Net exports	-7.0				-7.0	
GNP derived from SNI	366.1	192.9	50.8	128.5	-6.1	0
GNP estimated by CIA	382.1	194.7	73.5	120.1	-6.0	
Difference	-16.0	-1.8	-22.7	8.4		

change because government expenditures are defined to be equal to government incomes in the CIA accounts. Thus a reduction in one expenditure causes an increase in the residual expenditure category, outlays not elsewhere classified (n.e.c.). More research on these issues is needed, however, before a final assessment can be made.

The large difference between total GNP estimated from SNI and that directly estimated by CIA (16 billion rubles) is the result of a large category of unallocated income (32 billion rubles) in the CIA accounts. Depending on how much of this unallocated income arises in the nonproductive sphere, most of the gap between the GNP estimates can be closed.

In practice, a frequent use of the relationship between GNP and SNI is to make comparisons of Soviet GNP with the GNP of Western nations. This raises a large number of practical problems, although only a few will be mentioned here. One such problem is the definition of production boundaries: what is intermediate production and what is final use? For example, many government activities are really services provided to business for free or at nominal cost and do not represent their final use. In the Soviet Union, where so many services are provided by the government, this question is more significant. The Soviets consider the science sector to be nonproductive. In comparing Soviet and US

GNP, therefore, one must decide whether to include science expenditures in Soviet GNP or to exclude a large share to account for private research undertaken by US private business and included in the price of their products. Questions of this type are often decided arbitrarily.

The sharply different institutional structures of the Soviet and US economies also create problems. For example, the Soviets publish data on amortization deductions. These data represent all money actually set aside for depreciation in the productive and nonproductive sectors.²² Most Western constructions of Soviet GNP use this value for their estimate of total depreciation income, reasoning that since the US accounts make no allowance for depreciation of government capital, no allowance should be made in the Soviet case. This means, however, that the depreciation of government capital stock is not included. The government sector is a larger share of the economy in the Soviet Union than in the United States. Should a depreciation allowance be computed because it is relatively more important in the Soviet Union, or should depreciation be omitted, thus understating Soviet GNP in comparison with the United States? This is especially important if comparisons are to be made in the same monetary values, such as US

²² This is not quite accurate. Collective farms set money aside for depreciation. This amount is not normally reported, but must be estimated.

and Soviet GNP in dollars. The size of the ruble-dollar ratio used to convert Soviet GNP to dollars depends on the coverage of GNP in both nations.

Other significant problems for comparisons of GNP include:

- *Government investment.* In the United States, government investment in fixed capital is lumped together with current government expenditures. Since the US Government owns relatively small amounts of capital, this is not a serious divergence from theory. In the USSR the same procedure obviously cannot be followed. How then does one make a comparison? The practice has been to estimate US government investment and alter the US accounts.
- *Tax laws.* US business often charges its capital repair expenditures to a current account because this reduces current taxable income. The US GNP accounts reflect this practice. In the Soviet Union they are capital expenditures. Since there is no practical way to estimate US capital repair expenditures, the practice is to reduce Soviet capital repair expenditures by 50 percent, an amount estimated to be included in current expenses in the US.
- *Imputations and subsidies.* Since a number of imputations are necessary in both the US and Soviet accounts, valuation procedures will have a direct effect on any comparison. Agricultural income-in-kind is a prime example. Many food products are heavily subsidized in the USSR. Should household consumption of these products be valued at the subsidized retail price or at the price a producer would have received if there were no subsidy? The imputation for the rental value of private housing in the USSR is a similar problem. The United States makes imputations for financial service charges. The Soviet banking system, however, is radically different from the US system. Should the same type of an imputation be made as in the United States? Currently no financial service charges are imputed for the Soviet Union.

The problems discussed above illustrate just some of the difficulties that arise in comparing Soviet and US GNP. A different, but equally long list could probably be compiled with reference to comparisons of Soviet GNP with the GNP of any other Western nation.

Defense Expenditures and GNP

One of the most important aspects of constructing Soviet GNP accounts is determining the relationship of defense expenditures to total GNP. There are two methods of examining this. First, an independent estimate of defense expenditures could be explicitly inserted into the accounts and tested for consistency. Second, defense expenditures can be estimated as a residual—the difference between total expenditures and the sum of all identified outlays. The pitfalls of residual estimates are well known: any error in any estimate will create an error in the the residual, which will always contain other small components beside that being measured. Thus, a large error range must be given to any residual estimate unless high confidence can be given to each other entry in the calculation. CIA has recently published independent estimates of defense expenditures for 1970 of 40-50 billion rubles.²³ The question addressed here is whether this is consistent with CIA's GNP estimates.

US GNP accounts consist of five accounts: current income and outlay accounts for the personal sector, for government, and for the rest of the world; a consolidated savings and investment account; and a total GNP account. For the Soviet Union, it has not been possible to construct accounts in such detail. CIA has constructed private income and outlay accounts. The Soviet Union, however, does not publish enough data to separate the business sector from the government sector. Therefore, CIA estimates a consolidated public sector income and outlay account. Savings and investment data are included in the income and outlay accounts, so a separate account is not formed. The total GNP account is the third and final CIA account.

²³ CIA, *Estimated Soviet Defense Spending in Rubles, 1970-75*, May 1976.

These accounts are shown in tables 3 through 7.²⁴ The defense columns in tables 6 and 7 are not published as part of the CIA accounts, but are developed in this paper.

Defense expenditures are found only in the public sector outlay account, and the income used for these expenditures are found only in the public sector income account. There are two apparent exceptions. Household incomes include military wages and military subsistence expenditures (table 3, lines 3a and 3b) and household outlays include military subsistence expenditures (table 4, line 3b). The reasoning is as follows. First, military wages represent personal income at the disposal of individuals to be spent as they please for consumer products or services. These same wages are included in public sector outlays.

²⁴ These tables are taken from CIA, *GNP Accounts*, pp. 3-6 and 8. There have been a few small changes since that publication was issued. Tables 3 through 7 reflect the accounts currently used.

The only defense-related concern with the household incomes account is whether total incomes equal total outlays and if not, is it because military wages were estimated incorrectly. In this case, there is an unidentified income residual of 10.039 billion rubles (table 3, line 4b) with military wages identified as 4.32 billion rubles (table 3, line 3a). Thus, it does not seem that any reasonable increase in military wages could exhaust the residual although there is room for some increase.

The second defense-related entry in the household sector accounts is military subsistence, an imputed income and expenditure. It represents an estimate of how much the Soviet Ministry of Defense would have to increase military wages to permit members of the military to pay for the food, clothing, and other items now received free. If this were the case, then military wages would be increased by the amount of estimated subsistence, and personal expenditures for food and

Table 3
USSR: Household Incomes, 1970

	Billion Rubles
1. State wages and salaries	132.059
a. Worker and employee wage and salary bill	132.032
b. Profits distributed to consumer cooperative members	0.027
2. Net income of households from agriculture	41.577
a. Money wage payments by collective farms	14.453
(1) Payments to collective farm members	14.040
(2) Payments to hired workers	0.413
b. Net income from sales of farm products	8.264
c. Net farm income-in-kind	18.860
(1) Consumption-in-kind	18.347
(2) Investment-in-kind	0.513
3. Income of armed forces	7.700
a. Military pay	4.320
b. Military subsistence	3.380
4. Other money income currently earned and statistical discrepancy	12.708
a. Private money income currently earned	2.669
b. Unidentified money income and statistical discrepancy	10.039
5. Imputed net rent	1.080
6. Imputed value of owner-supplied building services	0.880
7. Total income currently earned	196.004
8. Transfer receipts	24.256
a. Pensions and allowances	21.955
b. Stipends	1.300
c. Interest income	1.035
d. Net new bank loans to households	-0.034
9. Total income	220.260

Table 4

USSR: Household Outlays, 1970

	Billion Rubles
1. Retail sales of goods for consumption	147.015
a. State, cooperative, and commission sales	143.180
b. Collective farm ex-village market sales	3.835
2. Consumer services	25.932
a. Trade union and other dues	2.092
b. Housing	3.429
(1) Cash rents	1.091
(2) Imputed net rent	1.080
(3) Repair	1.258
c. Other services	20.411
(1) Utilities	3.478
(2) Transportation	7.200
(3) Communications	1.200
(4) Repair and personal care	4.674
(5) Recreation and culture	2.647
(6) Education	1.064
(7) Health	0.148
3. Consumption-in-kind	21.727
a. Farm consumption-in-kind	18.347
b. Military subsistence	3.380
4. Total outlays for consumption	194.674
5. Investment	2.542
a. Private housing construction	2.029
b. Farm investment-in-kind	0.513
6. Total outlays for consumption and investment	197.216
7. Transfer outlays	23.044
a. Net savings	9.720
b. Direct taxes	12.737
c. Other payments to the state	0.587
8. Total outlays	220.260

clothing would be increased by the identical amount. Thus, the amount of military subsistence expenditures affects total household incomes and outlays but not their balance. Like military wages, defense expenditures for subsistence products are recorded in public sector outlays, and like wages, military subsistence has a civilian equivalent in income imputed for food and clothing received by nonmilitary employees because of the nature of their job. The expenditure for nurse's uniforms, for example, would be a part of health expenditures.

Public sector outlays encompass Soviet defense expenditures, but the particular method used in CIA's accounts requires an examination of public sector incomes as well. The major portion of defense expenditures should be contained in the category "outlays n.e.c." (table 6, line 5). This value is determined as the difference between

total public sector incomes and identified public sector outlays. Thus, any error or omission in any entry of the income or the outlay account will directly affect outlays n.e.c., and hence the residual available for defense expenditures.

Defense expenditures are not wholly contained in outlays n.e.c. Due to the manner in which the Soviets report their economic data, defense expenditures are almost certainly included in other public sector outlays. Expenditures for research and development surely include expenditures on military R&D (table 6, line 4). Similarly, defense expenditures may be included in investment, education, health, physical culture, and administration. Defense expenditures are probably not in art, general agricultural programs, forestry, municipal services, or capital repair. There is relatively little information on which to base estimates of defense expenditures contained

Table 5

USSR: Public Sector Incomes, 1970

	Billion Rubles
1. Net income retained by organizations	34.782
a. Retained income of collective farms	7.186
b. Retained profits of state enterprises	26.481
c. Retained profits of consumer cooperatives	0.794
d. Retained profits of other organizations	0.321
2. Charges to economic enterprises for special funds	12.414
a. Social insurance and social security	9.436
b. Education; research	2.978
3. Taxes and other payments to the budget	126.517
a. Tax on income of collective farms	0.666
b. Tax on income of consumer cooperatives and other organizations	0.569
c. Deductions from profits of state enterprises	53.110
d. Turnover tax	49.380
e. Miscellaneous charges	22.792
4. Allowance for subsidized losses, n.e.c.	-19.454
5. Consolidated total charges against current product, net of depreciation	154.259
6. Depreciation	31.827
7. Consolidated total charges against current product	186.086
8. Transfer receipts	23.044
a. Net savings of households	9.720
b. Direct taxes	12.737
c. Other payments to the state	0.587
9. Consolidated net income	209.130

in these other categories. The following are some crude estimates.

There are roughly 4 million people in the Soviet armed forces out of a population of 240 million people in 1970, or 1.7 percent. If we assume that they receive the same health care as the rest of the population, then defense would account for 1.7 percent of total health expenditures, or 0.2 billion rubles. The Soviet Union claims that almost 80 million people received education of one sort or another in 1970. Although the Soviets do have an extensive military education system, it seems unlikely that much more than 1 percent of total outlays for education, or 0.2 billion rubles, could be military.

Expenditures for state administration probably include substantial defense expenditures. It is likely that most expenditures for wages and materials for the current operation of the Ministry of Defense headquarters and of major command headquarters are in this category. Of the total expenditures 25 percent, or 1 billion rubles, could easily be defense.

Physical culture is a very small category, only 0.545 billion rubles (table 6, line 1d). Military expenditures are certainly less than 0.1 billion rubles and are ignored for this exercise.

Research and development is heavily military. Total expenditures are estimated to be 9.927 billion rubles (table 6, line 4). Estimates of military R&D range from 50 to 75 percent of total R&D. The Soviet published science expenditure value, on which the 9.927 billion rubles is based, is thought to be understated by about 30 percent. Thus, if we increase this total by 30 percent and take an intermediate share of 60 percent, military R&D would be about 7.5 billion rubles.

Finally, there is evidence that some defense expenditures may be included in outlays on new fixed investment and inventory change. Defense purchases a considerable volume of items commonly used in civilian activities. These items, which would be considered part of investment in the civilian sphere, include trucks, cars, cranes, forklifts, transport ships and aircraft, and organi-

Table 6

USSR: Public Sector Outlays, 1970

	Billion Rubles	
	Total	Defense
1. Communal Services	26.351	0.4
a. Education	15.034	0.2
b. Art	0.756	
c. Health	10.016	0.2
d. Physical culture	0.545	
2. General administrative and miscellaneous services	9.971	1.0
a. General agricultural programs	1.130	
b. Forest economy	0.822	
c. State administration (apparat)	3.952	1.0
d. Municipal and related services	4.067	
(1) Culture	1.379	
(2) Municipal services	0.712	
(3) Civilian police	1.562	
(4) Administrative organs of social organizations	0.414	
3. Gross investment	117.587	7.0
a. Fixed capital	102.433	7.0
b. Inventories	15.154	
4. Research and development (civilian and military)	9.927	7.5
5. Outlays n.e.c. (defense, net exports, and unidentified outlays) and statistical discrepancy	21.038	27.0
6. Consolidated total value of goods and services, exclusive of sales to households	184.874	40.9
7. Transfer outlays	24.256	
a. Pensions and allowances	21.955	
b. Stipends	1.300	
c. Interest payments to households	1.035	
d. Net new bank loans to households	-0.034	
8. Consolidated total outlays	209.130	

zational equipment. Direct cost estimates of these purchases in 1970 range from 2.5 billion to 4.5 billion rubles. Soviet publications dealing with investment, though somewhat ambiguous, seem to imply that such expenditures are reported as investment. The midpoint of the range, 3.5 billion rubles, will be used here.

Finally, defense expenditures for construction are almost certainly included in investment expenditures for construction. Estimates of the defense portion range between 1 billion and 2 billion rubles. We shall use the midpoint, 1.5 billion rubles, in this exercise. Thus far we have allowed for defense expenditures as shown in table 8. Adding the total to outlays n.e.c., of 21 billion rubles (table 6, line 5), we now have potential defense expenditures of 34.9 billion rubles. Next, we must exclude the nondefense expenditures included in outlays n.e.c. As de-

scribed in CIA's GNP accounts, these are net exports, outlays on the militarized KGB, and changes in strategic reserves. CIA estimates the latter two categories to total about 1 billion rubles.²⁵

When estimated in domestic prices, net exports are between -6 and -7 billion rubles. This raises the amount available for defense to 39.9-40.9 billion rubles, or just into the lower end of the direct cost range of 40-50 billion rubles. The interpretation of foreign trade accounting is important because it places a severe limit on sources of additional financing for defense. As mentioned in CIA's GNP accounts, there is a large budget income residual, almost 30 billion rubles. CIA takes 75 percent of this residual as current income, but states that up to 90 percent

²⁵ CIA, *GNP Accounts*, p. 17.

Table 7

USSR: Gross National Product in Established Prices by End Use, 1970

Billion Rubles

	Total	Defense
1. Consumption	221.025	0.4
a. Goods	168.662	
(1) Food	107.847	
(2) Soft goods	46.840	
(3) Durables	13.975	
b. Services	52.363	0.4
(1) Trade union and other dues	2.092	
(2) Housing	3.429	
(3) Utilities	3.478	
(4) Personal transportation	7.200	
(5) Personal communications	1.200	
(6) Repair and personal care	4.674	
(7) Recreation, art, and physical culture	3.948	
(8) Education	16.098	0.2
(9) Health	10.244	0.2
2. Investment	120.129	5.0
a. New fixed investment	86.364	
(1) Machinery and equipment	25.300	3.5
(2) Construction and other capital outlays	57.009	1.5
(3) Net addition to livestock inventories	4.055	
b. Capital repair	18.611	
c. Inventories	15.154	
3. Other public sector expenditures	40.936	35.5
a. General administrative and miscellaneous services	9.971	1.0
b. Research and development (civilian and military)	9.927	7.5
c. Outlays n.e.c. (defense, net exports, and unidentified outlays) and statistical discrepancy	21.038	27.0
4. Gross national product	382.090	40.9

could have been used. In fact, this increase is limited by the interpretation of foreign trade accounting. The basic hypothesis is that the profit accruing to the government from foreign trade operations is an income to the budget. If true, then this profit can be a current income only if net exports are valued in foreign trade prices. If net exports are in domestic prices, then the foreign trade profits cannot also be a current income. This point is developed in appendix A. Given the size of the budget income residual and foreign trade earnings, only about 23 billion rubles of the budget income residual could be included in GNP, even with no allowance for noncurrent income. CIA currently uses 22 billion rubles, which leaves a minimal allowance for noncurrent budget income. Conversely if one takes 90 percent or more of the budget income residual as public sector income, then the government's foreign trade earnings implicitly are in-

Table 8

USSR: Estimated Defense Expenditures in the Civilian Sector, 1970

Billion Rubles

Total	13.9
Health	0.2
Education	0.2
Administration	1.0
Science	7.5
Machinery	3.5
Construction	1.5

cluded. This requires that net exports be entered into public sector expenditures in foreign trade prices—a surplus of 0.9 billion rubles in 1970. The net effect of this argument is that the funds available for defense cannot be increased by increasing the share of the budget income residual that is included in GNP.

Before looking for additional sources of defense financing, an alternate possibility for testing the GNP accounts will be explored. Appendix B uses an input-output (I-O) table to describe the difference between GNP and SNI. The I-O table can also be used to test defense expenditures. For this we look primarily at the final demand quadrant of figure 2 in appendix B. Here we have columns for consumption, investment, government, and defense. Until now we have looked only at the total values for these columns in our attempt to isolate defense expenditures. That is, of total investment how much could be defense related? It is also possible to look at the rows. Given knowledge of the gross output of a sector, say the food industry, and knowledge of its interindustry sales, then we have the sales of the food industry to final demand. If we can then determine how much was sold to private consumption and how much to the civilian components of government we then have an implicit value for the sales of the food industry to defense. How does this value compare to the direct cost estimate of defense purchases from the food industry? Unfortunately, CIA estimates of defense expenditures are in 1970 prices, and we do not have a 1970 I-O table for the Soviet Union. CIA has made a pilot study of this nature, for the machinery industry only. This is probably the most important single sector to examine to determine if the order of magnitude of defense expenditures is correct, but the entire economy needs to be tested to narrow the range of uncertainty around total defense expenditures.

In order to test the machinery sector, CIA collected several estimates of the 1970 gross output of machinery and put them into a likely range of 84-90 billion rubles. It was then observed that the ratios of interindustry sales to gross output in the 1966 and 1972 I-O tables were the same. It was assumed that the 1970 ratio was within a narrow range around this ratio. The resulting estimate of the sales of machinery to final demand was 50-64 billion rubles. This range includes some sales by the sector, industry, n.e.c., to final demand other

than consumption. These sales were thought likely to be military machinery.²⁶ The second step was to estimate machinery sales to personal consumption, civilian government consumption, investment, foreign trade, and capital repair. Subtracting these estimates produced a machinery residual that conceptually included only military machinery. It does not include all military machinery. For example, the residual does not include purchases of military machinery to support: the current activity of military schools, hospitals, clubs, and so on; military R&D; administration of the Ministry of Defense; capital repair of any military equipment, including hardware; and exports. It does include the domestic production of: large hardware items such as planes, ships, tanks, missiles, space hardware, and nuclear weapons; small arms; ammunition; radar and other electronic equipment; organizational equipment such as typewriters, pots and pans, and gas cans; and machinery used in the current repair of all military equipment.

For each of the civilian end uses CIA estimated a range of values, the width of which depended upon the source of the basic data and our knowledge of Soviet data. The total value of these four civilian categories was 36-40 billion rubles, with a best estimate of 37 billion rubles. Subtracting this from total deliveries of machinery to final demand produces a range for the machinery residual of 10-27 billion rubles and a best estimate of 18.5 billion rubles.

The components of the direct cost estimates of defense expenditures were then adjusted to obtain an estimate of defense-related machinery purchases. With allowance for uncertainty, this estimate ranged between 13 billion and 21 billion rubles with a best estimate of 17 billion.

While the ranges computed from these two independent approaches are quite broad, they

²⁶ Since this study was completed, additional research on the 1966 I-O table has vindicated this position. The gross output and the nonconsumption final demand of the machinery sector have been increased by amounts consistent with the quantity used for 1970. This money came largely from the industry, n.e.c., sector, as hypothesized in the study.

can be said to be fairly coincident in their absolute values and their best estimates. As a result, CIA feels reasonably confident that the order of magnitude of the direct cost defense expenditures for machinery is correct.

Returning to other sources of defense financing, there are several possible sources of error in the residual method of calculating defense expenditures from GNP accounts. As already stated, the funds available for defense expenditures in CIA's 1970 GNP accounts depends on the values for every other entry in the public sector income and outlay accounts. The amount available for defense will rise if any income is understated or if any outlay is overstated. The estimated data in these accounts are reasonably well founded on published Soviet data, with the exception of the income from the budget residual discussed above. As seen at that time, CIA has already taken virtually the maximum possible from this source, and therefore it is not considered as a possibility for increasing the funds available for defense expenditures. The following are some other possible sources.

Services sold to intermediate consumption need to be excluded. The estimates of services such as health, education, and physical culture are derived from Soviet data on total expenditures for these services from the budget and other sources of finance. If any of these services are purchased by a productive sector for intermediate use, then that amount should not be counted as final use. For example, if total health expenditures include any made by an industrial enterprise and included in its production costs, then that amount should be excluded from GNP.

The total value of subsidies is entered as a negative public sector income (table 5, line 4). Soviet literature indicates that some of the agricultural subsidies may be netted against either profits or turnover taxes. If reported profits or turnover taxes have been reduced on this account, then gross subsidies should not be deducted, but only the amount which has not been netted out. If this is occurring, it could be a substantial amount, say 2-5 billion rubles.

Investment in 1970 prices is assumed to equal investment in 1969 estimate prices. To the extent that prices for construction and producer durables increased in 1970, investment would be understated, and the money available for defense would be overstated. Inflation in one year should not be great, but investment could be understated by 1-2 billion rubles.

Expenditures for state administration are derived from employment data. It is possible that a substantial portion of these people are employed in productive enterprises or ministries and supported as a part of production costs. In this case, their earnings would be included in the prices of the goods produced, and hence should be excluded from GNP by end use. One billion rubles seems plausible.

The CIA accounts allocate 1.6 billion rubles for civilian police. This is computed on the assumption that a large share of the employment category "other branches of material production" consists of civilian police. However, it is possible that, since they are in the sphere of material production, these employees may actually be security personnel at productive enterprises. In this case, their wages and other expenses would be included in the cost of production, and the 1.6 billion rubles should not be included in GNP.

The total value and accounting of science expenditures is uncertain. Soviet data indicate that total science expenditures are considerably higher than budgetary science expenditures. The source of these additional funds is not clear. CIA adds 50 percent of these funds to public sector incomes as a charge to individual enterprises for special funds (table 5, line 2b). It is possible that the entire amount should be added, which would have the effect of adding 2.5 billion rubles to the residual available for defense. In addition, many Western students of Soviet science believe that the Soviet value for total science expenditures is understated by about 30 percent. Depending on how the additional expenditures are accounted for, end use expenditures for science may in-

crease and defense expenditures might be increased or left unchanged.

The estimates of public sector expenditures for services and R&D (table 6, lines 1, 2, and 4) may be overstated by the value of depreciation. The CIA accounts conceptually do not include depreciation in these expenditures. Recent research indicates that the published Soviet expenditure data on which the CIA estimates were based, probably do include depreciation. In this case, the estimated expenditures on services and R&D should be reduced by about 4 billion rubles. This would add the same amount to defense expenditures.

There is some uncertainty about Soviet accounting for unfinished construction. Expenditures for the net increase in this variable (4 billion rubles in 1970) are certainly in investment. Some may also be in Soviet data on working capital. If so, then this quantity should be deleted from the GNP category, inventories, which in turn would raise the amount available for defense. In the reconciliation of GNP with SNI, this change would lower investment and raise current government expenditures, but would not change total GNP. Becker discussed this question in 1964 and concluded that Soviet data on working capital do not include unfinished construction.²⁷ In 1967 the Soviets published a statistical handbook that shows unfinished construction in the category "material working capital."²⁸ The other data in this table, however, do not correspond with the annually published data on the "commodity-material valuables" portion of working capital.²⁹ The few references to the subject in Soviet accounting

²⁷ Becker, Abraham S., *Soviet Military Outlays Since 1955*, The RAND Corporation, Santa Monica, 1964.

²⁸ *Strana sovetov za 50 let*, Statistika, Moscow, 1967, p. 37.

²⁹ For example, *Narodnoye khozyaystvo SSSR v 1975 Godu*, Statistika, Moscow, 1976, p. 731.

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books imply that the procedure is as Becker describes it. Thus, it is premature to assert that the entire value of unfinished construction is contained in working capital, but there is a possibility that some portion of it is.

Depending on how many of these possible errors have in fact occurred, the residual available for defense could exceed the high end in the range of 40-50 billion rubles. For illustrative purposes, assume that the following revisions are made to the GNP accounts:

- Deduct services sold to productive enterprises..... 2 billion rubles
- Treat some subsidies as netted against profit 2 billion rubles
- Inflation in investment between 1969 and 1970..... 1 billion rubles
- Administrative expenses included in production costs 1 billion rubles
- Depreciation deducted from expenditures on services.. 3 billion rubles

The resulting hypothetical GNP account, in an abbreviated form, is shown below with the defense component now equal to 47.8 billion rubles:

Billion rubles		
	Total	Defense
1. Consumption	216.1	0.3
a. Goods	168.7	0
b. Services	47.4	0.3
2. Investment	121.1	5.0
3. Other public sector expenditures	46.9	42.5
a. Miscellaneous services	9.0	1.0
b. Research and development	9.9	7.5
c. Outlays, n.e.c.	28.0	34.0
4. Gross national product	384.1	47.8

APPENDIX A

SOVIET FOREIGN TRADE ACCOUNTING

Because of the inconvertible currency used by the Soviet Union the treatment of foreign trade in SNI is not a simple matter. The Soviet Union has established a network of specialized foreign trade organizations (FTOs). Each such organization is responsible for buying certain types of domestic products and arranging for their export or for purchasing foreign goods and selling them to domestic enterprises. Because the exchange value of the ruble is artificial and relative prices in the USSR are quite different from those on the world market, the domestic prices within the USSR are often quite different from the foreign prices at which goods can actually be sold or must be purchased. In order to insulate the domestic economy from international prices, the FTOs purchase goods from domestic manufacturers at the domestic wholesale prices, less any turnover taxes, and sell them to foreign buyers at some agreed price. This price, when converted to rubles at the official exchange rate, may differ greatly from the domestic price and therefore the FTO may make a large profit or suffer a large loss in the transaction. Similarly, profits and losses may occur when the FTO sells imported goods at domestic wholesale prices, including turnover taxes.

Because the profits or losses sustained by the FTOs are unrelated to their economic performance, the state budget is used either to skim off the excess profits or to make up losses. The question here is how foreign trade should be accounted for in SNI and GNP. The Soviets are noticeably reticent in discussing their accounting procedures. From the little evidence available, it appears the value of net exports in SNIU is computed in foreign trade prices, data for which are published in the annual statistical handbooks. These are not the prices for which the exports were sold by the domestic producers or imports were purchased by domestic consumers. Assuming that net profits accrue to the state from foreign trade, then these profits must be entered as a negative value on the product side, or as a positive value on the income side, of the accounts in order for them to balance. The Soviets appear to enter these profits as income produced in the trade sector.¹

The result of the foreign trade accounting is (1) to enter a normally large profit due to price differences of internationally traded goods as part of SNI and (2) to enter what normally is a very small net export value in SNIU. The profits, often called special earnings of foreign trade, can be considered as the profits accruing to a monopoly trade organization or as the tariffs collected on imported goods.

¹ The Soviet method of accounting for foreign trade in national income was uncovered and developed by Vladimir Treml. For a complete discussion see, Vladimir G. Treml, Dimitri M. Gallik, Barry L. Kostinsky, and Kurt W. Kruger, *The Structure of the Soviet Economy*, Praeger, New York, 1972, pp. 147-180.

The Soviet practice generally has not been followed by Western economists in constructing Soviet GNP accounts. In most cases the net export value entered into the product account is computed in domestic prices. Since large profits normally accrue due to the price differences, the net exports computed in domestic prices often have large negative values.

When the Western practice of including net exports at domestic prices is adhered to, one must be careful not to include as an income the special foreign trade earnings. If this happens, incomes are overstated relative to expenditures and the residual of incomes less expenditures is incorrect. This is particularly important since the residual is often taken to be an indicator of defense expenditures.

Holzman extended Trembl's work to GNP accounts.² There are two basic approaches a GNP accountant can take to the foreign trade problem. First, one can consider the price differences to be a type of indirect business tax (in the case of a profit to the state), or a subsidy (in the case of a loss) and include the profits or losses with other nonfactor charges against GNP. In this case an imported good is considered to have entered the country at the low foreign trade price and a domestic tax has been added to it to reach the domestic price. In order to remove the influence of imports from GNP so that GNP reflects only domestic activity, one should subtract only the value in foreign trade prices because the remainder is the result of domestic activity. Similarly, if exports are given a domestic subsidy then they should be treated like any other subsidized product. The sale is entered in the GNP account at the subsidized (foreign trade) price, and a negative value is entered in the income account so that a balance is maintained. With this approach, the net gains or losses to the government from taxing or subsidizing foreign trade are entered in the income account, and exports and imports are entered in the GNP account in foreign trade prices.

The second general approach is to assert that GNP should measure expenditures at market prices for domestic production. Subtracting imports at foreign trade prices does not achieve this objective; it must be done at market prices. One can consider the difference to be an import tariff which does not represent any domestic production. Similarly, exports must be valued at the domestic market price. In this case, exports and imports are entered in the GNP account at domestic prices and no entry is made in the income account.

To further clarify these approaches, we can construct an input-output table. Let us divide the economy into three sectors: all domestic production (D); an import sector which purchases all imports and sells them at domestic prices (M); and an export sector which purchases all domestic production intended for export and sells it abroad (X). Figure 1 shows the transactions among the sectors. In the figure: d, m, and x represent the intermediate purchases made by the three sectors in order to conduct their business; v(d),

² Franklyn D. Holzman, *Foreign Trade Under Central Planning*, Harvard University Press, 1974, chapters 13-15.

Figure 1

USSR: Domestic Production and
Foreign Trade Sectors

	D	X	M	Final Demand	Rest of the World
D	d	x X(d)	m	FD	0
X	0	0	0	X(f)	0
M	M(d)	0	0	0	-M(f)
Value Added	v(d)	v(x) S(x)	v(m) S(m)		

$v(m)$, and $v(x)$ represent the normal value added of the three sectors in the form of wages, profits, taxes, and depreciation; $X(d)$ and $M(d)$ are exports and imports in domestic prices; $X(f)$ and $M(f)$ are exports and imports in foreign trade prices; FD is the domestic sales to final demand (consumption, investment, and government) of goods and services; $S(x)$ and $S(m)$ are the special earnings (losses) of FTOs due to the price differences. In other words, the special earnings of the export (import) sector are equal to what it sells its product; for $(X(f)$ and $M(d))$ less the cost of acquiring its product ($X(d)$ and $M(f)$); the value of purchases from other sectors; and its own value added.

In the figure all imports are shown as being sold to intermediate consumption. This is a simplification because many imported goods are consumer or investment goods that go directly to their final purchaser. In fact, however, virtually every imported good has some value added to it by some part of the domestic economy, if only a transportation charge from the port of entry to the delivery point. Thus, we can show all imports as sold to some domestic production sector which then uses the product or sells it to final demand. The purpose of subtracting imports from GNP is to remove the foreign content of the domestically purchased goods. This is not the price paid by the final purchaser, but the price paid by the importer. The difference is domestic value added. Thus, the FD variable in the figure includes the value of imports and the negative $M(f)$ is the subtraction of that value.

As shown in the figure $S(x)$ and $S(m)$ are calculated as,

$$\begin{aligned} S(x) &= X(f) - X(d) - x - v(x) \\ S(m) &= M(d) - M(f) - m - v(m) \end{aligned}$$

The figure as shown, illustrates the first approach described above. GNP is equal to domestic expenditures for consumption, investment, and government plus net exports in foreign trade prices, or $GNP = FD + X(f) - M(f)$. On the income side, $GNP = v(d) + v(m) + v(x) + S(m) + S(x)$. To convert to the second approach (that is, GNP measured at the market prices of domestic production) we would eliminate the $S(m) + S(x)$ term from the

income side and also subtract it from final demand in order to maintain a balance. This is not quite the same as putting foreign trade in domestic prices, as can be seen from the earlier equations defining $S(x)$ and $S(m)$. These two quantities equal the profit (loss) due to price differences less the intermediate purchases and value added of the FTOs. Thus, after converting we have:

$$\begin{aligned}
 \text{GNP} &= v(d) + v(m) + v(x) \\
 &= \text{FD} + X(f) - M(f) - S(x) - S(m) \\
 &= \text{FD} + X(f) - X(f) + X(d) + x + v(x) \\
 &\quad - M(f) - M(d) + M(f) + m + v(m) \\
 &= \text{FD} + X(d) - M(d) + x + m + v(x) + v(m)
 \end{aligned}$$

Thus GNP equals consumption, investment, and government, plus net exports in domestic prices, plus the intermediate expenditures of FTOs, plus the value added of the FTOs. Since there are 100 or more FTOs, and they are supposed to be *khozraschet* organizations, the last two terms should not be disregarded completely. Their sum, however, is small: 0.5 billion rubles would probably be a generous estimate.

APPENDIX B

GNP AND SNI IN AN INPUT-OUTPUT FRAMEWORK

Input-output (I-O) tables frequently can illustrate what would otherwise be obscure accounting concepts, such as the relation between GNP and SNI. This section reviews the territory already covered in the main body of this paper, but in terms of an I-O table. Figure 2 shows an I-O table in the Western style in which the final demand quadrant equals GNP and the value added quadrant equals the charges against GNP. Unfortunately, a large quantity of mathematical symbols are required. The figure shows an economy with n productive sectors in the Soviet sense, plus two service sectors. One service sector (x_p) is an aggregate of those services which are sold. The other (x_f) represents the services provided free by the government. Subscripts are placed in parentheses. That is, $x(i,j)$ represents the sales of the i th sector to the j th sector. Thus, there are $n+2$ producing sectors in the Western sense. The final demand quadrant consists of sales of these $n+2$ sectors to personal consumption (C), investment (I), civilian government (G), and military (M). The sum of these four sectors is GNP. Net exports are ignored in this example. The value added quadrant consists of just two rows, depreciation (x_d), and other charges against GNP (V, hereafter referred to as value added). There are a couple of peculiarities in the figure which should be noted. First $x_d(f)=0$, in accordance with the US practice of not including depreciation in the cost of government services. The cost of such services is simply the materials plus wages. Second, although x_f is the sector of free services, it does appear to sell $g(f)$ to government and $m(f)$ to the military.

Figure 2

GNP as Shown in a US Style I-O Table										
	$x(1)$		$x(n)$	x_p	x_f	c	i	g	m	Total
$x(1)$	$x(1,1)$	INTERINDUSTRY QUADRANT	$x(1,n)$	$x(1,p)$	0	$c(1)$	$i(1)$	$g(1)$	$m(1)$	X1
$x(n)$	$x(n,1)$		$x(n,n)$	$x(n,p)$	0	$c(n)$	$i(n)$	$g(n)$	$m(n)$	XN
x_p	$x_p(1)$		$x_p(n)$	$x_p(p)$	0	$c(p)$	$i(p)$	$g(p)$	$m(p)$	XP
x_f	0		0	0	0	0	0	$g(f)$	$m(f)$	XF
						C	I	G	M	Total
x_d	$x_d(1)$	VALUE ADDED QUADRANT	$x_d(n)$	$x_d(p)$	0	XD				
V	$v(1)$		$v(n)$	$v(p)$	$v(f)$	V				
						Total				
Total	X1		XN	XP	XF					

This is just the technical way of inserting wages into the final demand columns. The xf sector buys only the wages of government employees and sells these wages to the government and military. In this manner the column sum of the G sector will equal the current expenditures for these services and the column sum of the M sector will equal defense expenditures.

In figure 3, the US-style I-O table is converted into a Soviet-style I-O table. This is not the same as SNI. Statistically, it is impossible to distinguish between the current sales to investment that represent the accumulation of new assets and those that replace worn out assets. A numerical total can be computed using depreciation rates, but not the detail that an I-O table requires. Therefore, as a practical matter, the Soviets show depreciation as a separate row between the interindustry quadrant and the value added quadrant. The final demand quadrant includes total investment. The sum of all entries in the final demand quadrant equals the sum of the value added quadrant plus the depreciation row.

The major adjustment in going from figure 2 to figure 3 is the shift of the two service sectors out of the first quadrant. The value added quadrant (including depreciation) has decreased by the value added of services $v(p) + v(f)$, and by depreciation in the service sector, $xd(p)$. On the other hand, it has been increased by the value of sales of services to the productive sphere, the sum of $xp(i)$ for $i=1, \dots, n$.

That the final demand quadrant still equals the value added quadrant plus depreciation can be seen from the following: in an input-output table a column total is always equal to its row total. Thus, for the government services sector the gross output, xf equals its column sum, $v(f)$, and its row sum, $g(f) + m(f)$. Thus, when the row and column are shifted out of the interindustry quadrant, value added is reduced by $v(f)$ and final demand is reduced by $g(f) + m(f)$. But $v(f) = xf = g(f) + m(f)$. Therefore value added and final demand are reduced by the same amount.

Figure 3

A Soviet Style I-O Table

	$x(1)$		$x(n)$	xp	xf	c	i	g	m	Total
$x(1)$	$x(1,1)$	INTERINDUSTRY QUADRANT	$x(1,n)$	$x(1,p)$	0	$c(1)$	$i(1)$	$g(1)$	$m(1)$	X1
$x(n)$	$x(n,1)$		$x(n,n)$	$x(n,p)$	0	$c(n)$	$i(n)$	$g(n)$	$m(n)$	XN
xd	$xd(1)$	DEPRECIATION	$xd(n)$	$xd(p)$	0					
xp	$xp(1)$	SOVIET NATIONAL INCOME	$xp(n)$	$xp(p)$	0	$c(p)$	$i(p)$	$g(p)$	$m(p)$	
xf	0		0	0	0	0	0	$g(f)$	$m(f)$	
V	$v(1)$		$v(n)$	$v(p)$	$v(f)$					
Total	X1		XN							

The analysis of the paid services sector is somewhat more complicated. By the equality of rows and columns we know that,

$$\begin{aligned} \sum xp(i) + xp(p) + c(p) + i(p) + g(p) + m(p) \\ = \sum x(i,p) + xd(p) + xp(p) + v(p). \end{aligned}$$

Moving the xp row into the value added quadrant increases its total by the sum of $xp(1)$ through $xp(n)$, but decreases it by $xd(p)$ plus $v(p)$. Rearranging terms in the equation above we see that the net change in the value added quadrant is:

$$\begin{aligned} \sum xp(i) - xd(p) - v(p) = \\ \sum x(i,p) - c(p) - i(p) - g(p) - m(p). \end{aligned}$$

Since the right hand side of this equation is exactly the net change in the final demand matrix, equality is retained. The equality of row and column sums ensures that the value of the final demand and value added quadrants will always be equal, but it is sometimes valuable to trace the algebra of the situation to improve one's understanding of the problem.

The Soviet I-O format is only halfway to SNI. The other step is to move the depreciation row into the interindustry quadrant so that the value added quadrant equals SNI. Moving the row is accomplished easily enough. The problem comes in trying to move the equivalent column. There is none. As mentioned above, it is statistically impossible to determine which products are equivalent to depreciation. If machines were always replaced by identical machines then this might be possible. But old machines are replaced by technologically improved machines or perhaps not replaced at all. In this case we cannot identify the currently produced machine which is being used for replacement of depreciated capital stock. Algebraically we can perform this transformation. We define $x(i,d)$ as the production of the i th branch of the productive sphere which offsets depreciation. The column sum is total depreciation, not just productive depreciation. The result of creating this column and moving the row and column into the interindustry quadrant is shown in figure 4.¹

The first point to notice in figure 4 is that the investment column has been transformed into accumulation. This occurred when the depreciation column was created, and each entry in this column is defined as $a(i) = i(i) - x(i,d)$. Second, we have switched from US to Soviet accounting practices regarding depreciation of government capital stock. The entries now labeled $xd(f)$ and $xd(c)$ previously were defined to be zero. Finally, and most important, the final demand and value added quadrants now equal SNI. The final demand quadrant does not quite resemble SNIU. The column sums of the final demand columns nearly equal Soviet published data on SNIU. The

¹ The premier Soviet I-O specialist, M. R. Eydel'man, discusses this point at some length in his book, *Mezhotraslevoy Balans Obschestvennogo Producta*, Statistika, Moscow, 1966, pp. 206-219. The Soviet practical solution was to leave the depreciation column in final demand and to put the depreciation row between the interindustry and national income quadrants as in figure 3.

Figure 4

A Soviet I-O Table Reflecting SNI

	x(1)		x(n)	xd	xp	xf	c	a	g	m	Total
x(1)	x(1,1)	INTERINDUSTRY QUADRANT	x(1,n)	x(1,d)	x(1,p)	0	c(1)	a(1)	g(1)	m(1)	XI
x(n)	x(n,1)		x(n,n)	x(n,d)	x(n,p)	0	c(n)	a(n)	g(n)	m(n)	XN
xd	xd(1)		xd(n)	0	xd(p)	xd(f)	xd(c)				XD
xp	xp(1)	SOVIET NATIONAL INCOME	xp(n)	0	xp(p)	0	c(p)	a(p)	g(p)	m(p)	
xf	0		0	0	0	0	0	0	g(f)	m(f)	
V	v(1)		v(n)	0	v(p)	v(f)					
Total	XI		XN	XD							

joint sums of the xp, xf, g, and m columns equal the material purchases of the services, science, and administration. The C column sum equals private consumption. The sum of the A column is overstated by the amount of losses. A new column should be created for losses, but total losses are so small that this can be ignored here. Finally, there is no export or import column. Again, introducing foreign trade would confuse the illustration without clarifying any important points.

Comparing figure 4 with figure 2 we can easily see that GNP equals SNI plus $v(p)$ plus $v(f)$ plus xd less $\sum xp(i)$. On the product side, GNP equals SNI plus $c(p)$, $a(p)$, $m(p)$, $g(p)$, $m(f)$, $g(f)$, and xd , less $\sum x(i,p)$, $xd(p)$, $xd(f)$, $xd(c)$. Figure 4 also explains why the Soviets include nonproductive depreciation in consumption. Many Western observers have criticized these depreciation estimates as arbitrary, and misleading.² Depending upon how they are calculated they may indeed be arbitrary and misleading, but they are necessary. If their value is incorrectly calculated, the total value of accumulation will be biased in the opposite direction by an identical amount, since depreciation plus accumulation must equal investment.

² For example, see Abraham S. Becker, *Soviet National Income 1958-1964*, University of California Press, Berkeley, 1969, pp. 57-60.

